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WE BELIEVE IN GROWING ALBERTA'S ECONOMY

Looking Beyond the Forest

Agrifibres may soon have the pulp and paper, and other manufacturing industries in Alberta, looking beyond the forest to farmers' fields for raw materials.

In Alberta, there is a finite supply of forest resources, so the search is on for alternate non-wood materials that can be used for making paper, panels, and construction materials. The answer may lie in agriculture fibres (agrifibres): cereal straw, hemp, flax, and perennial grasses.

Agrifibres offer viable alternatives to wood with many advantages. For one, agrifibres can be harvested yearly versus waiting decades for trees to grow. Alberta also produces an abundance of residual straw from crop production on a yearly basis, much of which is often either burned or buried. "It's a small step to go from having limited cost-effective uses of straw to developing a whole new industry that adds value," says John Christensen, a bio-industry consultant. "It makes sense; there's market demand and the technology to do it." A further advantage for wood-deficient pulp and paper mills is the availability of an alternate fibre source which, when blended with wood fibres, produces papers with unique and desirable properties, and at the same time has the added advantage of taking less time to pulp (breakdown into individual components) than wood fibres alone.

There are, however, challenges that need to be overcome before the pulp and paper industry utilizes agrifibres such as cereal straws. "Probably the biggest reason for people not pulping cereal straws on a wide-scale basis is recovery issues," says Wade Chute, Lead of the Pulp and Paper Group at the Alberta Research Council (ARC). "Wood contains less than one per cent silica, whereas cereal straw contains seven to 11 per cent silica by weight of the plant." Silica can interfere with the chemical recovery process used by modern pulp and paper mills. "The silica causes scaling or coats the equipment with a glass-like substance," Chute explains. This substance reduces the efficiency of some equipment by restricting heat transfer, increasing the thickness of the used cooking liquor (black liquor) making it difficult to pump, and potentially plugging some of the equipment. "This makes chemical recovery for wheat straw less energy efficient and more costly, and it releases more noxious compounds into the atmosphere," he adds.

Chute is working on a viable solution to this chemical recovery problem. He has developed a chemi-mechanical desilication process, which utilizes a mild chemical treatment and a mechanical process to remove the silica from the surface of the wheat fibres before they are used

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Looking Beyond the Forest

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in the pulping process. And although the system is not yet commercialized, Chute hopes it will remove this technical hurdle so that pulp and paper mills will be able to use more cereal straw in the future.

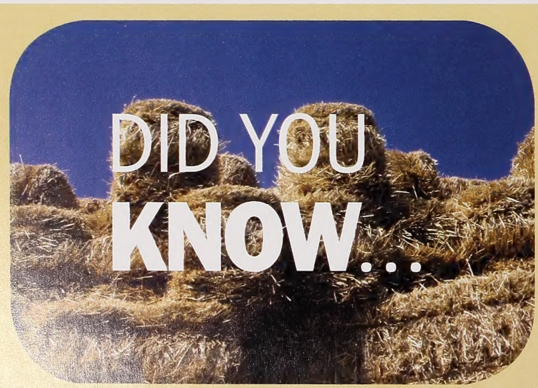
Building with Agrifibres

"Straw is also used to manufacture non-structural panels for making cupboards and cabinets," says Wayne Wasylciw, Technology Director of Forestry Products at ARC. Wasylciw and colleagues recently developed a machine which splits the straw lengthwise with a minimal decrease in strand length and uses the split straw to manufacture oriented split strawboard. This structural material is more economical to produce and can be substituted for plywood or oriented strand board (OSB). "We are currently testing the process on a larger scale at a small factory to prove that this is a viable process," says Wasylciw. "If the process works on this scale, then it should be able to be scaled up for even larger plants." Because of its advantages in surface quality, Wasylciw feels that this product has the potential to be marketed where wood-based OSB board is currently limited.

Backed by AARI funding, this research, conducted at ARC, the University of Alberta, and private pulping mills in Alberta, is helping to make an agrifibre industry in Western Canada possible. "What needs to be done is to stimulate interest – educate people on how agrifibres can be used, their pulping properties, and the costs required to pulp them," says Chute. "We need to work on the economics of the process, apply modern day technology to purify and separate the fibres for commercial use, and ensure the fibres are of a consistently high quality so that we can compete with other fibre producing nations," adds Christensen. "Once the processing infrastructure is developed, within the next decade or so Alberta will produce a lot of agrifibres."

Although there is still much to be done, the benefits to agriculture, the environment, and Albertans are clear. For a start, farmers will have access to new markets, increasing demand for cereal and flax straw and boosting prices. "Flax straw is currently worth about $5 per tonne in the field," says Christensen, "but the world market for clean flax fibre is $1,500 a tonne – that's a big difference." Growing hemp, perennial grasses, and other fibre crops will also provide expanded marketing opportunities for Alberta's agriculture sector. Furthermore, agrifibres, whether used alone or in combination with wood blends, may help ensure long-term stability of Alberta's pulp and paper industry by providing a supplemental fibre source, opening the potential for using agrifibres in other industries as well.

So the next time you buy paper or purchase new cabinets for your house, it just might be a product made from agrifibres.



- Alberta produces approximately seven million tonnes of wheat straw and 25,000 tonnes of flax straw each year.
- Flax fibre is used to make currency, cigarette paper, and tea bags.
- The inner portion of the hemp stalk is known as hurd. Hurd is three to four times more absorbent than wood chips and is used to make cat litter and horse bedding.

Barley Express

Most consumers in today's fast paced society are looking for food products that are quick, easy to prepare, and healthy, which is why Hong Qi and her team of researchers have been cooking up new ways to serve barley.

Although barley has many health benefits, such as being low in fat and having high levels of dietary fibre and a low glycemic index, it is not often consumed as a whole grain due to its lengthy cooking time of approximately one hour. Thanks to a joint research project being conducted in Alberta, however, consumers may soon see quick-cooking barley on the grocery store shelf.

Hong Qi, Project Engineer, Centre for Agri-Industrial Technology (CAIT), Processing Development Division, Alberta Agriculture, Food and Rural Development (AAFRD), and several other researchers from AAFRD, have teamed up with Dr. Feral Temelli, a Professor at the University of Alberta's Department of Food Science and Nutrition, to develop a quick-cooking barley product.

During the initial phase of research, completed last year and funded by the Alberta Crop Industry Development Fund and the Alberta Barley Commission, Qi explains they were able to produce a barley product with a cooking time of just 15 minutes. "This barley has comparable flavour, texture, appearance, and nutritional composition, such as beta glucan content, when compared to long-cook barley, but takes only one quarter of the cooking time," says Qi.

The next phase of research is now underway and is focused on pre-commercialization and market testing. "The project will test appropriate processing equipment, and optimize processing parameters to achieve the desired physical and textural characteristics of the products determined in Phase I," explains Qi. "Enough quick-cook barley will be produced for market testing."

Preliminary market research shows an interest in a quick-cooking barley product from various sectors including hospitals, food services, and restaurants, as well as the retail and export markets. "In Phase II of the project, targeted market research in each of these areas will be conducted," she says.

According to Qi, the goal is simple: to put a quick-cooking Alberta barley product on the market as something similar to quick-cooking rice. Qi says Progressive Seeds Inc. has been an industrial partner and is gearing up for the commercialization of quick-cooking barley products. "With six million tonnes of barley produced annually, this is a unique opportunity to add value to an Alberta commodity," Qi explains. "The development of quick-cook barley will provide the market with a range of convenient, nutritious foods."

If Qi's vision becomes a reality, it's just a matter of time before consumers are jumping on the barley express.

Cooking with Quick-cooking Barley

Follow these basic cooking instructions for quick-cooking barley:

- 2 cups water
- 1 cup quick-cooking barley
- 1 tsp butter

Combine barley, water, and butter in a saucepan and bring to a boil. Stir, cover, and reduce heat to medium/low. Simmer for 15 minutes, remove from heat, and set aside until water is absorbed (about 5 minutes).

This gives you plain cooked barley for use as a side dish or with any stir fry recipe.

Set for Success

These good news stories from AARI and Funding Consortium joint efforts are generating industry excitement.

Each year, AARI funds numerous projects to advance Alberta's position as a global player in the agriculture and food sector. AARI and members of the Funding Consortium continue to make an even greater impact in building our agricultural industry by supporting key strategic R&D initiatives, leading to innovation and growth for the industry.

Alberta Poultry Centre

Alberta's poultry industry is set to become a leader in value-added processing and product development. Funding Consortium members, the University of Alberta, industry, and the province have recently announced they are directing $15 million over five years to the Alberta Poultry Research Centre, allowing increased research, development, and commercialization of value-added poultry meat and egg products. Formed in 1986 to consolidate poultry R&D in Alberta, the Centre can now add two new research positions that will help them find new ways of adding value to poultry products, including investigating nutraceutical benefits of egg products and more uses for dark poultry meat. The Centre will also hire a commercialization expert to help move from research to marketable products – creating more benefits for producers right in Alberta.

Dr. Feral Temelli

Beta Glucan Benefits

R&D efforts into beta glucan, a soluble fibre component of both barley and oats, are leading to new and valuable functional food markets for Alberta farmers. Known to reduce cholesterol, regulate glucose levels, stimulate immune response, reduce heart disease, and reduce the risk of Type 2 diabetes, University of Alberta researchers have developed the technology to extract beta glucan from crops to create new products with special health benefits. They have already developed two beverages and a low-fat breakfast sausage product using beta glucan from barley, and are working on developing dairy products boasting beneficial beta glucan. This fractionation technology also spurred the development of Cevena Bioproducts Inc., a U of A spin-off company, to commercialize high quality oat and barley-based nutritional products such as Viscofiber, the highest quality concentrated barley and oat beta glucan available.

Floating Success

Several years ago, AARI-funded research proved that it was possible for plants such as safflower to generate antibodies in the oilbodies of seeds, and to separate them by "floating" them out of the oil. SemBioSys Genetics resulted from this success to pursue the promise of not only a safer means to produce drugs, but also cheaper, more widely available ones, as well as potential new pharmaceuticals that until now were not economically feasible. This platform technology has enabled SemBioSys to produce insulin and a developmental cardiovascular drug called Apo AI. Plus, it has attracted five private companies to invest in Alberta, worth over US$20 million collectively. Producing plant-made pharmaceuticals is on track to improve the health of Albertans and the economy.

Bioplastic Brilliance

Led by Dr. Suresh Narine, researchers can now create bioplastics from canola or flax oils – a renewable resource from Alberta's fields. Bioplastics are an alternative to conventional plastics made from fossil fuels, which are in finite supply and are generally not biodegradable. Scaling up the processes developed in the lab is now underway, with researchers striving to commercialize Alberta-made bio-plastics for use in the medical and automotive industries. Alberta has a lot to look forward to – value-added marketing opportunities for oilseed crops, environmental benefits, attraction of research and skilled personnel from around the world, and the economic boost of a growing agri-processing sector.

Reach & Discover

Not only has Alberta been home to these, and many other success stories, there is now a great vehicle to spread the word – *R&D: Reach & Discover.* Brought to you by the members of the Funding Consortium, *Reach & Discover* helps share the innovation, excitement, and impact of Alberta's agricultural research and development on all aspects of life. Numerous stories have already garnered attention by various media outlets from association newsletters to web sites to national magazines, achieving the goals of generating interest and increasing the profile for Alberta's R&D community.

AARI and the Funding Consortium

AARI and other members of the Agriculture Funding Consortium continue to support R&D projects which will drive growth in the agriculture sector. Here are some of the new projects that AARI and members of the Funding Consortium are funding.

Investigations into the Use of Protein-based Agricultural By-product for the Production of Industrial Foaming Agents

Drs. David Bressler & Anthony Yeung, University of Alberta

Foaming agents are comprised of a mixture of different compounds that generate foam for various uses such as smothering fire and enhancing oil recovery from drilling operations. A protein-based foaming agent would use the proteins as the molecules that help create and stabilize the foam. The goal of Bressler and Yeung's project is to investigate, on a macroscopic level, the effect of chemically modifying agricultural proteins to create new bio-degradable foaming agents from agricultural by-product streams such as refined bonemeal and bloodmeal. If successful, the final process will be tested for its ability to destroy the prion responsible for Bovine Spongiform Encephalopathy (BSE). In the end, it is anticipated that a safe industrial product can be created from this high-risk material.

Development of a Protocol and Capacity to Test for Spring Viremia of Carp Virus

John Derksen, Lethbridge Community College

Spring Viremia of Carp (SVC) is a fish disease, first introduced into the United States a few years ago from Europe, which can cause a virus in a variety of fish including cyprinids, the group carp belong to. SVC has not been detected in Canada yet, but in order to export to the United States or elsewhere, Canada must certify its fish are free of the disease. Since there is not currently a lab set up to test for SVC in Canada, Derksen is planning to use Consortium funding to develop testing protocols while, at the same time, ensuring the integrity of the carp stocks at Lethbridge Community College's Aquaculture Centre of Excellence (ACE). He is hopeful the Department of Fisheries and Oceans (DFO) will then consider ACE as a disease testing centre for national surveillance of Canada's wild fish stocks.

Novel Approaches to Infectious Disease Control

Dr. Voker Gerdts, University of Saskatchewan

Infectious diseases affect more than 30 per cent of all pigs, causing substantial economic losses for Canada's pig industry. Treatment with antibiotics is under increasing public scrutiny and many countries have banned antibiotic use for livestock; therefore, alternative therapies and strategies for managing infectious animal diseases need to be developed. Antimicrobial peptides (AMPs) occur naturally in many livestock species and work like an antibiotic, neutralizing bacteria and stimulating the immune system. Presently, little is known about the importance of AMPs in livestock production and the extent they protect against respiratory diseases, a problem Gerdts' work seeks to understand and address. Initially, the research will determine the prevalence of AMPs in the respiratory tracts of pigs throughout the province and their method of regulation. In phase two, the goal is to identify how the level of AMPs can be modulated by stress, exposure to pathogens, and specific manipulation including vaccination. This work will result in new strategies for treating pigs and cattle for bacterial infections and will have significant economic benefit to Alberta's livestock industry.

Development of Pesticides and Disinfectants for Prevention and Control of Microbial Biofilms Associated with Plant Diseases and Seed Pathology

Dr. Lyriam Marques, MBEC Bioproducts Inc.

In nature, most micro-organisms grow as complex communities attached to surfaces (biofilms) rather than as free-living single-cell organisms. Fungal biofilms are involved in several economically devastating vascular plant diseases, including fusarium head blight, potato ring rot, and soft rot. Biofilms also play a role in disease transmission through the contamination of both seed and equipment used in agri-food production. Many of today's biocides, pesticides, and sanitation products are ineffective against biofilms. The goal of Marques' project is to use patented technology, developed by Alberta-based MBEC Bioproducts Inc., to rapidly test potential anti-microbial compounds for use against several agricultural biofilm problems. Secondly, the project will investigate biofilms in bean seeds and screen for anti-biofilm compounds for seed decontamination. The knowledge gained from this research will help develop products and recommendations for pesticides and disinfectants which are designed to be effective against biofilms. This treatment and prevention of plant diseases and post-harvest decay problems will benefit several sectors of the agri-food industry.

New Projects Funded by AARI beginning in 2005/06

AARI funding is leveraged with funding from industry and other members of the Funding Consortium.

Proposal Title	Team Leader	Organization	Amount Funded by AARI
Agri-Fibre Feedstock Chemical Composition and Morphological Property Database	Dr. Shijie Liu	University of Alberta	$360,525 over three years
Development of Water Saving Irrigation Management Practices for Dry Bean in Alberta	Mr. Leigh Morrison	Alberta Agriculture, Food & Rural Development	$20,000 over three years
Development of Barley Lines with Enhanced Water Use Efficiency Using the 13C Discrimination Technique	Dr. Anthony Anyia	Alberta Research Council	$172,500 over five years
Investigations into the Use of Protein-Based Agricultural By-product for the Production of Industrial Foaming Agents	Drs. David Bressler & Anthony Yeung	University of Alberta	$90,045 over three years
Distribution and Characterization of Persistent and Non-persistent Listeria Strains in Three Processed Meat Facilities	Dr. Valerie Bohaychuk	Alberta Agriculture, Food & Rural Development	$140,000 over two years
Development of Pesticides and Disinfectants for Prevention & Control of Microbial BioFilms Associated with Plant Diseases and Seed Pathology	Dr. Lyriam Marques	MBEC Bioproducts	$165,000 over three years
Marker-Assisted Breeding for Fusarium Wilt Resistance in Canola	Mr. Ralph Lange	Alberta Research Council	$52,500 over two years
Integrated Weed Management in Narrow-Leaved Lupin and White-Flowered Faba Bean for Assured Market Access	Dr. Dan Cole	Alberta Agriculture Food & Rural Development	$24,650 over two years
Novel Approaches to Infectious Disease Control	Dr. Volker Gerdts	Vaccine and Infectious Disease Organization	$255,000 over five years
Lowering the Saturated Fatty Acid Level in Canola Seed Oil	Dr. Saleh Shah	Alberta Research Council	$823,650 over four years
Development of a Protocol and Capacity to Test for Spring Viremia of Carp Virus	Mr. John Derksen	Lethbridge Community College	$35,000 over two years
Breeder Parent Age Affects on Fertility, Embryonic Mortaility, and Broiler Chick Quality	Dr. Gaylene Fasenko	University of Alberta	$10,000 over one year
		Total	**$2,148,870**

“Eggscellent” Enhancements

Eggs have always made a significant contribution to the Canadian economy but recent research on eggs has cracked open new doors for the industry.

Here's some food for thought – eggs are chock full of high-quality protein, vitamins, and minerals and contain all nine essential amino acids required for health. Historically, the egg market has consisted of white and brown eggs raised under similar conditions. However, recent research within the industry has led to enhancements of the egg, which has opened doors for the Canadian egg industry.

Designer Eggs

By adding flaxseed to laying hens' diets, researchers at the University of Alberta discovered that they could raise the level of heart-healthy omega-3 fatty acids in the hens' eggs. This discovery led to Dr. Jeong Sim's patented label for these omega-3-rich eggs – Designer Eggs. These Designer Eggs make it easier to meet daily requirements for omega-3 fatty acids, especially in North American diets that don't include a lot of fish (another source of omega-3s).

Sim explains that the type of fatty acid we eat is as important as the ratio of omega-3 to omega-6. While Canadians usually don't have trouble getting enough omega-6 fatty acids, omega-3s and omega-6s should be in balance – a one-to-one ratio. “These eggs not only have an increased level of omega-3s, they also are perfectly balanced for omega-6s,” Sim says.

Changing the fatty acid profile of eggs is only the beginning; Sim explains that there are two other areas that he and his team are working on to help boost consumption of eggs by enhancing their healthful characteristics. The next stage of Designer Eggs will be to use the hens' immune systems to produce eggs that fight off *Salmonella*, and even allow those with celiac disease (an intolerance to gluten) to enjoy bread products. Celiac disease means sufferers can't enjoy or digest most wheat, rye, and barley products. Sim explains that they are very near to commercializing an egg that contains 250 mg of immunoglobulin Y that, when ingested, can actually bind, immobilize, and prevent absorption of certain allergens, like gluten.

“Our current project is evaluating the effectiveness of consuming a modified egg, either fresh or processed, and averting an allergic reaction to gluten,” Sim says. “These findings could then be applied to peanut allergies.”

“Eggsploring” the Implications

What implications do the new advancements in egg research have on the quality of table eggs, and what is the consumer knowledge of these products? These are questions that undergraduate students in the Department of Agricultural, Food and Nutritional Science at the University of Alberta have been busy answering. Last year, students in Dr. Gaylene Fasenko's Animal Science 471 class conducted two research projects on eggs. The first project concentrated on the quality of various types of table eggs available in the Edmonton marketplace to determine which had the best external and internal qualities. The second project examined consumer knowledge and preferences regarding these products to determine the primary factors that influence Edmonton area consumers to purchase eggs.

“In the past, the two main types of eggs available were white and brown eggs; however, the development of numerous table

Much “eggcitement” has been garnered around the wonderful things researchers have accomplished with eggs.

egg products has led to an increase in the choices for consumers," says Fasenko. Some of the eggs available include not only generic white and brown eggs, but eggs produced by birds housed under alternative environments (free-run and free-range), eggs from hens reared under organic conditions, or eggs that are nutritionally enriched via feeding the hens specialized diets, like omega-3 enriched eggs.

For the egg quality project, 120 dozen eggs were purchased over a two week period. Each week, 60 dozen eggs were collected from three retail food outlets: Safeway, Superstore, and Save-on-Foods. Of the 120 dozen eggs, 30 dozen from each of four different categories of eggs were studied: generic white, generic brown, nutritionally enriched, and alternative housing. As soon as the eggs were purchased, all relevant information was recorded, including price, variety of eggs offered, and the proportion of the display area. Each egg was weighed and visually inspected. Cracked eggs were recorded and removed from the study. Eventually, all eggs were opened and an internal inspection was performed.

There is no brand loyalty which means that there is a great marketing opportunity available in the table egg marketplace.

The research results showed that time to expiry, egg weight, shell weight, specific gravity, albumen height, incidence of blood and meat spots, and the degree of yolk integrity varied between egg types and retail locations. In addition, the following conclusions were made:

- Specialty eggs cost more than generic eggs, with alternative housing eggs costing more than nutritionally enriched eggs.
- Generic white eggs had the largest proportion of store display space.
- Generic brown eggs had the highest egg and shell weight as well as the longest time to expiry but also had the poorest albumen quality and the highest incidence of internal egg problems.
- Specialty eggs had the best shell quality as measured by specific gravity in various salt solutions.

For the consumer preference study, an 18-question survey was developed and distributed on two separate days to a total of 203 consumers at a local grocery store. The results from the survey are very promising for the future of the egg industry. The results indicate that consumers prefer to buy large generic eggs due to habit, cost, and because they work well in recipes. There is no brand loyalty which means that there is a great marketing opportunity available in the table egg marketplace. Furthermore, there is a need for better awareness of specialty type eggs, which obtain a premium price, to increase consumer purchase.

The Future

Susan Gal, General Manager of the Alberta Egg Producers, agrees that there are many opportunities to expand the egg industry in the future and feels this should be done through further research and development. "We held a two-day strategy session last spring with the four poultry boards, industry, and researchers. The priorities that were established for the egg industry include value-added product development, housing, inoculation of birds with the development of probiotics, spent fowl with product utilization and welfare post-production, and bone strength and shell quality initiatives," explains Gal. "We have concluded that R&D, in particular new value-added product development, will help us in achieving our goals." Gal says financial assistance, such as funding provided by AARI, is the key to continuing egg research in the future.

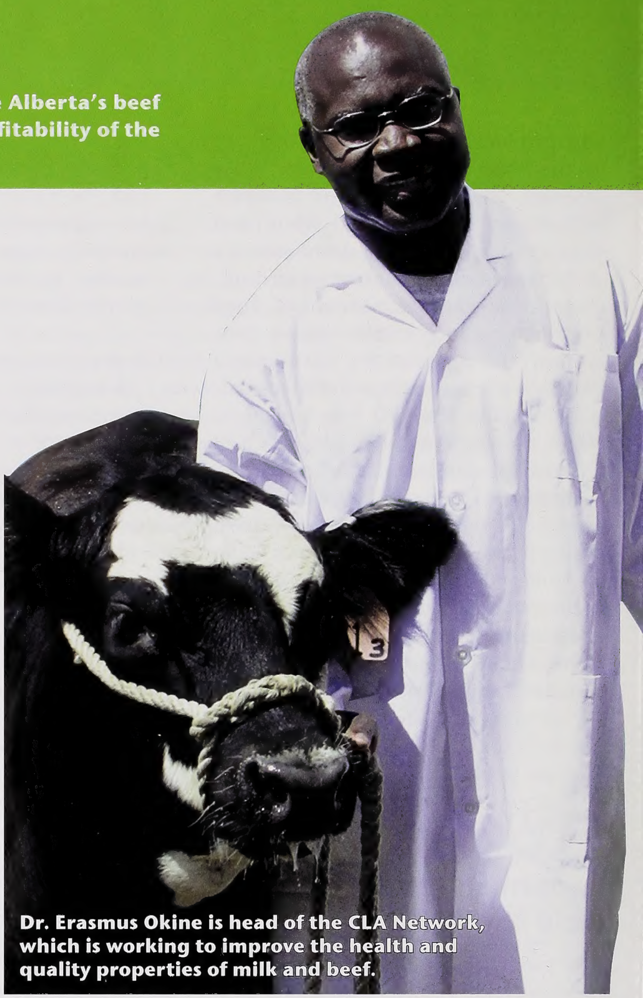
Much "eggcitement" has been garnered around the wonderful things researchers have accomplished with eggs thus far, and a bright future lies ahead as researchers across Canada keep exploring ways to enhance the health benefits of the egg.

DID YOU KNOW...

- There are no nutritional differences between traditional brown and white eggs.
- The egg yolk is the major source of the egg's vitamins and minerals.
- Eggs are one of the few foods that naturally contain vitamin D.
- One to two eggs provide one serving from the Meat and Alternatives group on Canada's Food Guide to Healthy Eating.
- The egg industry contributes about $410 million to the Canadian economy each year.

Better Beef

Dr. Erasmus Okine's research is finding ways to make Alberta's beef even more tender and juicy while improving the profitability of the province's beef producers.



Dr. Erasmus Okine is head of the CLA Network, which is working to improve the health and quality properties of milk and beef.

The top priority of the CLA Network is to improve the health and quality properties of milk and beef. So it makes sense that Dr. Erasmus Okine, an Alberta Agriculture, Food and Rural Development Associate Professor for Ruminant Nutrition and Metabolism at the University of Alberta, would be the head of the CLA Network. "All of my life I've been interested in understanding the process of fatty acid synthesis, with a basic aim of developing systems to produce high quality beef," says Okine.

One of the compounds that aids in producing high quality beef and milk is CLA, or conjugated linoleic acid, which has also been reported to have anti-carcinogenic properties in the rodent model and is being investigated for its human health benefits.

One of Okine's findings is that in beef, CLA increases the amount of marbling fat (which makes a steak tender and juicy) and reduces the amount of waste, or subcutaneous fat, which an animal lays down under its skin to keep it warm. "Waste fat is a big drain on the resources of the feed industry," says Okine. "In North America it costs $4 billion to remove waste fat, package it, and get rid of it."

When you consider that Alberta is the leading province in terms of the number of animals slaughtered and that over 60 per cent of beef production in Canada happens here, it's no wonder Okine is trying to reduce one of the waste products of beef production.

This isn't the only project Okine is working on – he is the leader of another CLA project that also aims to decrease waste fat and increase marbling. Finishing cattle on pasture results in a higher net income, around $190 per animal compared to approximately $172 per feedlot animal. "However," says Okine, "animals finished in pasture don't tend to marble very well." In terms of grading, which takes into account marbling, about 33 per cent of animals finished on pasture make "A" or "AA" grade, while some don't even make grade. In the feedlot, however, 89 per cent of animals grade A or AA.

> "Waste fat is a big drain on the resources of the feed industry. In North America it costs $4 billion to remove waste fat, package it, and get rid of it."
>
> – Dr. Erasmus Okine
> University of Alberta

Okine and his team are trying to determine what it is about the finishing methods that has such a dramatic affect on marbling and grade. They are looking at adipogenic factors which increase marbling and anti-adipogenic factors which tend to negate fat synthesis and deposition. "There seems to be higher marbling fat depots on concentrate-fed animals," says Okine. "In fact, animals finished in the feedlot tend to have three times higher adipogenic factors than those on pasture. We also found out that the anti-adipogenic factors were two times higher in animals finished on pasture than in animals fed concentrate, which means that marbling fat production is limited."

While the exact causes of this are not known yet, Okine and his team have some results that will help producers get more out of their cattle. "We now know that the vitamin A requirement for finishing animals is 40,000 IUs per day," says Okine. "Based on our research, we discovered that only two kilograms of grass and alfalfa mixture is required to meet the needs of finishing steers. If they eat more than two kilograms they have less marbling fat."

This research is important to the success of Alberta's beef industry, and Okine stresses the critical role of funding from AARI and other funders such as the Alberta Livestock Industry Development Fund, the Agriculture and Food Council, and the Alberta Beef Producers. "If we didn't have AARI and the other funding agencies as our core backbone of funders, none of this work would have been possible," says Okine. "The research opportunities in Alberta, where the funders believe in the contribution we make to the economy, are an important component of getting research out there to improve beef."

With a dedicated researcher like Okine working hard to better beef, the industry can be confident that Alberta will continue to be a producer of top quality beef.

Learning From Down Under

Could an Australian model for funding research and development be applied in Alberta and Western Canada? Don Macyk thinks so.

Alberta already has an effective R&D funding model in the Agriculture Funding Consortium, but that doesn't mean we can't learn from the folks down under. Australia's Grains Research and Development Corporation (GRDC) is a not-for-profit corporate entity that is responsible for investing in R&D in the grain, oilseed, and special crops sectors. The organization's model for funding is generating such positive results for Australian agriculture that it is attracting attention from Canada as a model worth studying for its potential here.

According to Don Macyk, an Alberta farmer who has studied the Australian approach, the GRDC is a central body that provides leadership in the Australian grain sector by investing in priorities identified by farmers and the industry. The target areas can include anything from production to value-added research and development. The GRDC receives its capital from a compulsory one per cent producer check-off of gross farm sales, which is then matched by the government by up to 40 per cent.

Macyk, who is also the Chairman of the Agricultural Products Marketing Council and former Managing Director of AARI, says the Australian model has a number of strong points. "This model works because it brings together an extensive network of farmers, industry, and government participants from across Australia that sets strategic priorities for investing in research capacity," says Macyk. "It's highly market driven because the model for decision making and accountability is to farmers and industry. It is a model that needs to be emulated."

One of the key features of this system is the ability of the Australians to create a comprehensive strategic plan. This is accomplished by identifying outcomes integral to the industry's success, creating capital and resources to get the job done, and then reviewing the plan and continually realigning, if need be, to maintain a market driven focus. The plan is then executed, while accountability for the resources invested is maintained.

The GRDC model draws on numerous resources, including five major federal research stations and 23 cooperative research centres. It facilitates collaboration between federal, state, and farmer organizations and can even access international talent. "The cooperative research centres and rural development corporations have created a high level of confidence in the farming community that priorities are being addressed," Macyk explains.

Through funding, the GRDC leverages more than $350 million related to the crops industry. Since the implementation of the model in the 1980s, Australia has seen results: in the past decade alone, the overall volume and value of crop production has increased by between 30 and 50 per cent and exports of all crop kinds have increased by 25 per cent.

Macyk is a proponent of implementing key features of the model in Western Canada, especially the market driven focus of the Australian model, the leadership that farmers and industry provide, and the dual challenge of having all parties, including farmers, recognize the vital role of R&D to agriculture's continued success and creating the funding capacity to ensure that success.

The Australian model works because it brings together an extensive network of farmers, industry, and government participants from across the country that sets strategic priorities for investing in research capacity.

There are a number of things that need to come together for an initiative like this to move forward in Western Canada. "You have to invest in areas that are going to make the most significant impact down the road," says Macyk. "To do that, you need to work in a linked way with all the players in the value chain."

Macyk says Alberta is already going in this direction with the Agriculture Funding Consortium, but there are still pieces of the puzzle that aren't working together. "We need to really look at where we're at and where we want to get to in the agriculture industry," says Macyk. "And we need to enlist support right from the start." This could include expanded development of agricultural products as substitutions for hydrocarbon-based products ranging from plastics to alternate fuels, to moving beyond agriculture to relationships with forestry or fibre bioproducts as well as human nutrition and health – keeping the industry competitive and sustainable. "Farmer leadership and investment in the R&D system is essential to the sustainability of our farm community and our industry," says Macyk.

With forward thinkers like Don Macyk keeping the interests of Canadian agriculture uppermost, it's certain that funding models will continue to evolve, ensuring the best options for our own industry.

Processing Research into Products

The Food Processing Development Centre ensures Alberta's agricultural wealth results in value-added products that consumers can use.

Alberta has a wealth of prime agricultural land, encompassing everything from livestock production to cereals and oilseeds to special crops. Not satisfied to just farm this land, visionaries in the province are ensuring that the fruits of the soil end up as value-added products on the grocery store shelf. One of the tools used to do this is the Food Processing Development Centre (FPDC) in Leduc.

The facility, which was established in 1984, is meant to help Alberta's food industry develop new products and processes for commercial food products. As well, the Centre explores and investigates new food technologies for manufacturing products. "In Alberta, food manufacturing is the number one employer," says Brian Rhiness, Assistant Deputy Minister of Industry Development for Alberta Agriculture, Food and Rural Development (AAFRD) and a member of AARI's Board. "Developing new products and building this kind of industry is extremely important to Alberta's economy."

The FPDC is a well-used facility and has had to expand to keep up with demand for its services. The 33,000 square foot facility was enlarged in 2002 and is undergoing another expansion with the creation of the $21 million Agrivalue Processing Business Incubator, which will be connected to the Centre. But the expansion isn't the only proof that this facility is working overtime getting new food products out the door. Ron Pettitt, Director of the Processing Development Division of AAFRD, says the FPDC is responsible for an average of 100 new products on grocery store shelves in a given year. Out of that, he estimates that 30 of these products haven't been seen on the market before.

The FPDC provides an important step for companies just starting up. "For the last 10 years, there's been the opportunity for clients to run their businesses out of the facility," says Pettitt. "A new company comes in with an idea that they want us to help them develop into a product. We test the marketplace, which is usually quite successful, and then the difficult thing is the company often has no place to make their product. Until they can grow their business to the point where they have a co-packing arrangement with an existing processor or they can build their own facility, we allow them to operate out of our facility." The FPDC typically graduates two companies a year.

Comprehensive Processing Plan

The FPDC is part of the Processing Development Division of AAFRD. The four units that comprise the Division are uniquely positioned to provide R&D facilities for food processing companies. Working in tandem with the Centre for Agri-Industrial Technology, the Food Science and Technology Centre, and the Sensory Evaluation Centre, the FPDC is able to draw on the resources found at these other facilities. For instance, when testing a product for commercial viability, the FPDC will use a database at the Sensory

> "The FPDC is responsible for an average of 100 new products on grocery store shelves in a given year."
>
> – Ron Pettitt
> AAFRD

Evaluation Centre to find participants for a product focus group.

These focus groups are designed with the target market of the product in mind, says Pettitt. "If a product is designed for young males, such as a snack food, we would bring young males in to test the product, considering the appearance, flavour, and packaging," he explains. "Likewise, if it was an ethnic food product, we would bring in people of East Indian or Chinese descent to try out the product."

One of the products the Centre helped is Bassili's Best Lasagna. This product was developed by Frank Bassili and was selling well within Alberta when the company went to the FPDC for help. The Centre helped develop and accommodated a larger production scale. The production capacity helped the Bassilis expand their market territory before building their own larger federally inspected production facility. That was in 1995. Bassili's Best brand is now sold all across Canada and has grown to be the most popular and fastest selling brand of lasagna.

Pettitt says there's a diverse range of products that come out of the FPDC, and with consumers becoming more health conscious, functional foods are among them. "Some of the interesting products are ones where companies are developing new food ingredients out of agricultural commodities," says Pettitt. "Ceapro has extracted beta glucan from oats – a component that helps reduce cholesterol – and has been quite successful doing so. They're growing quickly and operating out of our facility right now, but will likely move into the Agrivalue Processing Business Incubator once it's finished."

The Agrivalue Processing Business Incubator

The Agrivalue Processing Business Incubator couldn't come at a better time. The FPDC is experiencing a high demand for its services, especially from companies that don't yet have a facility where they can manufacture small batches of their product. While the Centre has been allowing companies to set up shop in its facility, the situation is not ideal. "At the Centre, there are restrictions on time, for example," says Pettitt. "Companies can only run a single shift. At the Incubator, they will be able to run a double shift five days a week if they want, which will allow a company to grow more quickly."

At the FPDC there are common areas where companies can manufacture their product, but that means two or three companies working in the same space. The Incubator, which is set to be operational in March 2006, will offer dedicated processing space, shared administrative services and facilities, shared storage space, and mentoring assistance to new food companies. Companies such as Ceapro, who have already developed a product at the Centre, will be able to do product scale-up work at the Incubator, in a space they can run as their own plant.

Bassili's Best Lasagna is one of the products the Food Processing Development Centre helped develop and accommodate a larger production scale.

PHOTO COURTESY BASSILI'S BEST

Investigating New Technologies

One of the mandates of the FPDC is to investigate new technologies that would be of use to food processing in Alberta. To accomplish this, the FPDC relies on funding from other sources like Alberta's Agriculture Funding Consortium. "We're not in the research business," says Pettitt. "Most of our work is applied, but when we dip our toe in the water, it's important to have funding for our work."

One of the things the FPDC is investigating is different ways of using agricultural commodities. "We're working on cows over thirty months old and finding new ways of using the meat in the industry," says Pettitt. "We don't always have a client but we're trying to develop a range of products out of these older animals so the industry can apply that information and develop products that can be marketed in Canada."

"Because of the BSE issue, the Centre has been very helpful in working with companies to develop new meat products, particularly related to older animals which currently can't cross the border," says Rhiness.

The Food Processing Development Centre is a valuable tool in increasing the food processing industry in Alberta. Rhiness says that the addition of the Incubator will further that growth. "This project sends a clear message to the world that we want to and will continue to build the value-added part of our business. We want to attract medium and large size companies because we can partner with them in R&D activities through facilities like the Food Processing Development Centre."

Moo-ving Towards the Future

Alberta's beef industry is moving towards a united front for R&D that will help strengthen both the competitiveness and the capacity of the industry

Representatives of the Alberta beef industry, the research community, veterinarians, processors, support agencies, and funders took part in a strategic planning session in January of this year. The two-day inaugural meeting, hosted by the Alberta Beef Producers (ABP), the Alberta Livestock Industry Development Fund, and the Alberta Agricultural Research Institute, provided an opportunity to identify industry-driven R&D priorities that will address industry needs, which includes producers, processors, and consumers, as an integrated whole.

By the end of the session a total of 11 R&D priorities were developed and prioritized by exploring the range of factors that affect the beef industry and the R&D process. The top five ranking priorities in order of importance were:

1) Production Efficiencies
- Develop low cost production systems
- Improve feed efficiency to lower production costs and manure output
- Enhance nutrition and health aspects through production practices and genetics
- Map the beef genome to improve both beef quality and traceability, and identify diseases

2) Market Identification and Development
- Identify consumer preferences and demands, including demands for branded products
- Develop new marketing strategies and new markets, both domestically and internationally

3) Animal Health, Welfare, and Food Safety
- Increase zoonotic disease research, focusing on presence, testing, and control to improve production and consumer confidence
- Improve animal health and welfare diagnostic capacity

4) Alternative Uses for Specific Risk Materials (SRM)
- Develop value-added food and non-food products for SRM
- Determine alternative uses and disposal methods for SRM

5) Environmental Sustainability
- Determine impact of intensive livestock operations on the environment
- Improve industry acceptance
- Develop methods to convert waste products into profit

"The meeting brought all the players together and was a great building and awareness exercise, which brought to the surface the whole kaleidoscope of research needs and initiatives," says Brenda Schoepp, Chair of the ABP Technical Committee. "At the same time, the meeting provided a strong understanding of the capabilities of all of the different players in both the beef and beef cattle industries."

Currently, the Beef Strategic Planning Session report is being circulated with the beef industry organizations and a broader community of stakeholders to ensure the finalized priorities are aligned with the entire industry's goals and will produce the desired results. When complete, priorities will help guide the stakeholders in regards to beef R&D needs.

"The ABP Technical Committee is reviewing the planning session report and will decide on the areas to focus our funding efforts – research areas that add measurable value to beef producers," says Schoepp.

The other six R&D priorities identified at the January meeting include:

- Marketing Over-Thirty-Month Beef
- Traceability
- Developing New Products
- Waste Management
- Risk Management
- Clostridial Management

In the end, participants felt the session had been exceedingly worthwhile. According to Schoepp, one session participant summarized the value of the meeting this way: "The process was an eye opener as to the level of commitment and the wide range of activities currently going on within the industry."

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>
> – Brenda Schoepp, Alberta Beef Producers

Profiling our Partners –
Climate Change Central

If you cycle to work, use energy efficient light bulbs, or lower your thermostat at night, you are helping Climate Change Central and its partners achieve a vision of zero greenhouse gas emissions.

More and more Albertans are taking action to tackle climate change and its impacts thanks to the efforts of Climate Change Central (C3). The unique organization partners with Alberta businesses, governments, organizations, institutions, and individuals to develop demonstration projects and deliver programs which lead to a reduction in greenhouse gases (GHG): carbon dioxide, methane, and nitrous oxide. "We are currently the only climate change-related organization within Canada and have worked with over 100 partners to advance and fund innovative pilot projects, initiatives, and programs," says Paul Hunt, Vice-President of C3.

Supported by the province of Alberta, the federal government, and industry, C3 works with numerous stakeholders on GHG reduction initiatives covering four areas:

- Energy efficiency and conservation
- Emissions trading and offset development
- Technology and market development
- Climate change impacts and adaptation

From increasing Alberta's awareness of climate change, to identifying priorities and appropriate regulatory policies, to assisting with technological demonstrations and market opportunities for new technologies, C3 takes a leadership role in the development of innovative responses to global climate change and its impact. The organization also acts as a delivery agent for information on best practices, communicating climate change solutions and accomplishments to Albertans.

In addition, the organization strives to leverage funding through various partnerships, including Alberta's Agriculture Funding Consortium where Hunt believes C3 has a distinctive function. "Our role is to share C3's criteria for reviewing GHG-related projects to indicate which projects would be valuable in terms of reducing or offsetting GHG emissions, and to consider those projects that will be able to demonstrate new technologies through future demonstration pilot projects. Demonstration projects that C3 would be able to participate in," adds Hunt. "The Integrated Manure Utilization System pilot project which uses manure to produce electricity, heat, bio-based fertilizer, and reusable water located on Highmark Renewable's feedlot near Vegreville, Alberta is just one example of the type of demonstration projects that we participate in."

Even though the agriculture industry is only responsible for approximately 10% of Canada's GHG emissions it can play an important role in combating global warming. "By taking part in the Consortium's round table sessions, C3 is able to improve our network within the agricultural sector, a sector that can do a lot for the large industrial emitters to actually offset GHG emissions," says Hunt. This may be through modifying farming practices to reduce emissions and by storing carbon molecules in the soil.

Paul Hunt

In the future, Hunt hopes to provide information to those submitting research proposals to the Funding Consortium. Helping them specify how their projects and demonstrations are GHG related should lead to more funding for this area. He says that a recent Alberta Agriculture, Food and Rural Development report prioritizing GHG research gaps will be used to help determine the needs for further GHG-related projects.

As the commercial says, "take action" – do your part to conserve energy. With the help of C3, the agriculture industry will do its part to reduce GHG emissions, to the benefit of all.

DID YOU **KNOW**...

- As a result of human activities, greenhouse gases (GHGs) are accumulating in the earth's atmosphere, causing surface air and sub-surface ocean temperatures to rise.
- Fossil fuel use accounts for about 85 per cent of the total amount of GHGs emitted each year.
- GHGs stay in the atmosphere for nearly 100 years once they have been produced.
- Each year every Canadian uses the equivalent of four trees in paper products and produces on average over five tonnes of GHGs.

Director's Corner

Board & Executive offer insight and perspective

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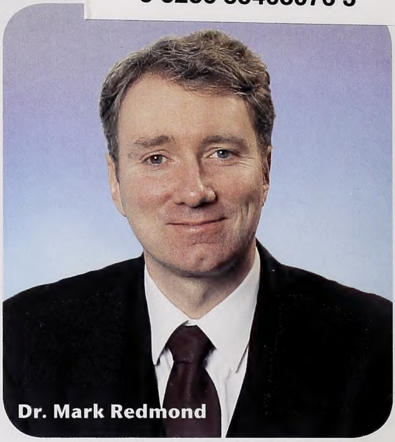
By building expertise in agricultural research, Alberta is becoming a world leader in human health. Dr. Mark Redmond, President and CEO for Ceapro and a member of the AARI Board of Directors, explains how this fusion between agriculture and human health is happening and why it's important.


Dr. Mark Redmond

If you ask Canadians what their number one concern is, they will answer health; however, there appears to be a disconnect between concern and action. Although many people realize that an active lifestyle and a balanced diet contribute to good health, there is often a lack of knowledge on what more they can do to maintain or improve their health. In Alberta we have the opportunity to make healthy options more available to Canadians through research and the development of new foods, nutraceuticals, and pharmaceuticals. Recognizing the importance of health and wellness, AARI has established this area as a priority (one of three) and is facilitating research which will lead to the discovery of food's health benefits and ultimately the development of value-added or new products.

While there is a growing awareness of new products, like nutraceuticals, available as a result of emerging technologies, consumers generally do not understand how best to use these advances to enhance their own health. Research that is focusing on the nutritional components of foods, such as oats, illustrates the point. Oats are a source of many important nutritional components: beta glucans, tocopherols, phonolics, and phytosterols, all of which have specific health benefits including lowering cholesterol and reducing the risk of cardiovascular disease, cancer, and diabetes. All these health benefits have researchers looking at new uses for oats, in pasta and noodle products for example, to facilitate uptake. Oats are also the functional ingredient in Ceapro's new screening test which allows for early detection and prevention of diabetes.

Capitalizing on opportunities to transfer even more health benefits to foods, AARI also provided funding for research on adding flax to laying hens' diets to increase the level of heart-healthy omega-3 fatty acids in eggs. These omega-3 rich eggs, known as Designer Eggs, make it easier to meet the daily requirement with just one egg providing half the recommended intake. This polyunsaturated fatty acid, most commonly found in fish and now Designer Eggs, plays an important role in decreasing the risk of cardiovascular disease by lowering blood triglyceride levels, positively benefiting human health.

> In Alberta we have the opportunity to make healthy options more available to Canadians through research and the development.

The development of these healthy, value-added, made-in-Alberta products is possible when research is connected to the business community through partnerships. We have strong industry links along the value chain from the seed developer or livestock breeder to the farm, through to companies delivering health and wellness benefits not only at home but throughout the world. Alberta is becoming recognized as a world leader in this technology with the development of companies like Ceapro, SemBioSys, and others.

There are some things we can do about our health today, as well as things we can do to ensure a sustainable future. We are building Alberta's leadership position in medicine and agri-biotechnology advances, really fusing the two disciplines. And fusion is power. The areas of focus in health and wellness R&D in Alberta include novel protein production, food for health, animal health products, and personal care products.

I have been fortunate in my career to work in both human and animal health areas, taking projects from academic research to the international marketplace. My wish is that this work will not only benefit our health, but will provide economic drive in terms of new jobs in Alberta and revenues from product sales.

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The Link is a quarterly newsletter published by the Alberta Agricultural Research Institute (AARI) that communicates with Alberta's agriculture and research communities. Submissions and feedback are welcome.

AARI was established by the Alberta Science and Research Authority Act and funds numerous projects each year that play a significant role in advancing Alberta's position as a global player in the agriculture and food sector. AARI's mission is to enhance the economic contributions of the Alberta agricultural and food industry through support for research and technology transfer, with a strategic emphasis on life sciences.

AARI is also a member of Alberta's Agriculture Funding Consortium. The Funding Consortium is a strategic partnership of agricultural funding groups that was created to provide better funding for research and development in Alberta's agricultural industry. This unified approach provides a one-window application process for researchers, reducing and simplifying the application workload while ensuring proposals are exposed to a maximum number of funders. The Funding Consortium's goal is to ensure that funding decisions and investment made within Alberta's agricultural sector are consistent with the industry's vision for a thriving and innovative future.

Alberta
INNOVATION AND SCIENCE

ASRA
Alberta Science and Research Authority